10-26-00

A

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R § 1.53(b))

Attorney Docket No.	68135486-200600
First Inventor	Masashi Shiraishi et al.
Title	A NOVEL BONDING STRUCTURE FOR A HARD DISK DRIVE SUSPENSION USING ANISOTROPIC CONDUCTIVE FILM
Express Mail Label No.	EL563098693US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Commissioner for Patents
Box Patent Application
Washington DC 20231

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing.)
2. ☒ Specification [Total Pages 12]
(preferred arrangement as set forth below)
   - Descriptive Title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed Sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. ☒ Drawing(s) *(35 U.S.C 113)* [Total Sheets 12]
4. ☒ Oath or Declaration [Total Pages 2]
   a. ☒ Newly unexecuted (original or copy)
   b. ☐ Copy from a prior application (37 C.F.R. §1.63(d))
   (for continuation/division with Box 16 completed)
      i. ☐ DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b)
5. ☐ Microfiche Computer Program *(Appendix)*
6. ☐ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
   a. ☐ Computer Readable Copy
   b. ☐ Paper Copy (identical to computer copy)
   c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. §3.73(b) Statement ☐ Power of Attorney
9. ☐ English Translation Document *(if applicable)*
10. ☐ Information Disclosure Statement PTO-1449
    ☐ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☒ Return Report Postcard (MPEP 503)
13. ☐ Small Entity Statement
    ☐ Statement filed in prior application, status still proper
14. ☐ Certified Copy of Priority Document(s)
15. ☐ Other:

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: ____ / _____

Prior application information: Examiner: Group Art Unit:

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

Baker & McKenzie
Two Embarcadero Center, Suite 2400
San Francisco, CA 94111-3909
Telephone: (415) 576-3000
Facsimile: (415) 576-3099
Customer No.: 24276

By: U. Bhakar
Vid Bhakar
Registration No. 42,323

Date: 10-25-00

FEE TRANSMITTAL

For FY 2001

Patent Fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT	($898)

Complete if Known	
Application Number	NEW
Filing Date	HEREWITH
First Named Inventor	Masashi Shiraishi et al.
Examiner Name	Not Yet Assigned
Group Art Unit	Not Yet Assigned
Attorney Document No.	68135486-200600

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

50-0974
BAKER & MCKENZIE

Deposit Account Number & Deposit Account Name

☒ Charge any additional fees required under 37 CFR §§ 1.16 and 1.17
☐ Applicant claims small entity status.

2. ☒ **Payment Enclosed:**
☐ ☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

LARGE ENTITY Fee Code	Fee ($)	SMALL ENTITY Fee Code	Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility	710
106	320	206	160	Design	
107	490	207	245	Plant	
108	710	208	355	Reissue	
114	150	214	75	Provisional	
				SUBTOTAL (1)	$710

2. EXTRA CLAIM FEES

		Extra Claims	Fee from below	Fee Paid
Total Claims	26 - 20 **	= 6	x 18	= $ 108
Independent	4 - 3	= 1	x 80	= $ 80
Multiple Dep.			*	= $ *

*** or number previously paid, if greater; for Reissues, see below:*

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description
103	18	203	9	Claim in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim, if not paid
109	80	209	40	** Reissue ind. claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent
				SUBTOTAL (2) $188

FEE CALCULATION (continued)

3. Additional Fees

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee	
139	130	139	130	Non-English specification	
147	2520	139	2520	Filing a request for re-examination	
112	920*	112	920*	Req. publ. of SIR prior to Ex. Action	
113	1840*	113	1840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within 1st mo.	
116	390	216	195	Extension for reply within 2nd mo.	
117	890	217	445	Extension for reply within 3rd mo.	
118	1390	218	695	Extension for reply within 4th mo.	
128	1890	228	945	Extension for reply with 5th mo.	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1510	138	1510	Pet to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1240	241	620	Petition to revive - unintentional	
142	1240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petition related to provisional apps.	
126	240	126	240	Submission of IDS Statement	
581	40	581	40	Recording each patent assignment per property (x no. of properties)	
146	710	246	355	Filing a submission after final rej.	
149	710	249	355	For each add'l. invention to be examined (37 C.F.R. § 1.129(b))	
Other fee (specify):					

*Reduced by Basic Filing Fee Paid **SUBTOTAL (3)** $

SUBMITTED BY

Baker & McKenzie
Two Embarcadero Center, Suite 2400
San Francisco, CA 94111
Telephone: (415) 576-3000
Facsimile: (415) 576-3099
Customer No. 24276

Date: 10-25-00

By: U. Bhakar
Vid Bhakar, Reg. No. 42,323

Rev. 10/01/00

A NOVEL BONDING STRUCTURE FOR A HARD DISK DRIVE SUSPENSION USING ANISOTROPIC CONDUCTIVE FILM

BACKGROUND OF THE INVENTION

This invention generally relates to the field of disk drives, and more particularly to forming optimal structures for bonding in a head gimbal assembly using anisotropic conductive adhesive.

With the rapid progress of miniaturizing and thinning technology for electronic devices, high-density inner wiring systems including flex-print circuit (FPC) have become essential. At the same time, micro-connecting technology for the connection of FPC with other electronic parts, such as the traces on a magnetic head suspension assembly, is indispensable.

Traditionally the FPC is capable of adopting ultrasonic bonding. The connecting terminals of the FPC are plated with gold; the flying leads of the FPC are aligned with and pressed to the bonding pad on the suspension with sufficient force to keep the alignment and atomic interdiffusion of the flying leads and the underlying metallization, which process ensures the intimate contact between the two metal surfaces. However, the pressing of the flying leads of the FPC entails complex processing, and ultrasonic bonding to different bonding pads is very difficult to contact. Moreover, bonded parts cannot be separated in the future to be reworked without damaging the FPC or the suspension.

Alternatively, FPC can be solder-bound using solder bumps produced by, for example, plating processes, for interconnections. However, this process requires forming metal cores and solder bumps for soldering. The metal cores incur extra expenses, and soldering has to be performed at high temperatures typically over 180 degrees Celsius.

Furthermore, both ultrasonic bonding and soldering are becoming increasingly expensive because of high cost of labor and parts of the FPC. There is therefore a need for a bonding method which achieves a stable, reworkable connection without complicated processing.

SUMMARY OF THE INVENTION

The present invention features a novel structure and method for using anisotropic conductive adhesive to bond parts in a head gimbal assembly (HGA) comprising the slider and the FPC.

It is an object of the present invention to overcome the complexities of prior art approaches of ultrasonic bonding and soldering. This invention will alleviate the difficulty of one-time bonding in the case of ultrasonic bonding, and avoid high-temperature bonding required in soldering.

It is another objective of the present invention to reduce the bonding pad size and floating capacity.

Yet another objective of the present invention is to reduce the space between bonding pads to accommodate the trend toward miniaturization of the disk drives and the head assemblies.

A further related objective of the invention is to improve capacity in the bonding process. Reduced sizes of the bonding pads, reduced spacing between the bonding pads, and elimination of additional interconnecting components will contribute to reduce parasitic capacitance. Reduced capacitance will improve the rise and fall time of the electronic signals, thus increase the data rate of the hard disk drive.

In one aspect, the invention relates to adding a conducting structure lodged between the two sections of an overcoat layer of a FPC to enable bonding between the FPC and a contact pad in a HGA using anisotropic conductive adhesive, such as anisotropic conductive film (ACF). The conductive structure can be shaped as a ball and plated with gold, or it can of other types of conductive materials. The overcoat layer may overlap a portion of the top surface of the conductive pad, or the overcoat layer may not touch the conductive pad at all. Alternatively, the conductive structure may be a filler comprising an electrically conductive material completely filling the space between the two sections of the overcoat layer and above the conductive pad. In one implementation, the overcoat layer may comprise one section, or it may be of ultra thinness of less than 10 μm.

In another aspect of the invention, a conductive layer of the FPC may be bound to the contact pad directly by anisotropic conductive adhesive material without an overcoat layer in between.

Other features and advantages of the present invention will become apparent from the following drawings and the detailed description accompanying the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a wireless suspension of a head gimbal assembly.

FIG. 2 is a top view of a FPC bound to the wireless suspension of FIG. 1.

FIG. 3 is cross-sectional view of the structure of a conventional FPC.

FIG. 4 is a cross-sectional view of the structure of a wireless suspension bonding pad.

FIG. 5A is a cross-sectional view of the conventional FPC of FIG. 2 positioned on top of the wireless suspension bonding pad of FIG. 4.

FIG. 5B is a cross-sectional view of the conventional FPC of FIG. 2 bound to the wireless suspension bonding pad of FIG. 4 using anisotropic conductive adhesive.

FIG. 5C is a cross-sectional view, after reliability test, of a conventional FPC of FIG. 2 bound to the wireless suspension bonding pad of FIG. 4 using anisotropic conductive adhesive.

FIG. 6 is a cross-sectional view of a novel bonding structure between a FPC and a wireless suspension using anisotropic conductive adhesive.

FIG. 7 is a cross-sectional view of a second novel bonding structure of a FPC.

FIG. 8 is a cross-sectional view of a third novel bonding structure between a FPC and a wireless suspension using anisotropic conductive adhesive.

FIG. 9 is a cross-sectional view of a fourth novel bonding structure between a FPC and a wireless suspension using anisotropic conductive adhesive.

FIG. 10 is a cross-sectional view of a fifth novel bonding structure of a FPC.

Like parts in different drawings are labeled with like numbers.

DESCRIPTION OF THE PREFERED EMBODIMENT

Referring to FIG. 1, this is a standard wireless suspension. Trace 112 is patterned on top of a flexture piece which runs from slider 120 to bonding pads 102, 104, 106, and 108, transporting electro-magnetic signals from slider 120. Base plate 100 supports bonding pads

102, 104, 106, 108, to which a FPC is bonded for transmitting signals to elsewhere in a hard disk drive, such as a circuit on the actuator arm. The number of contact pads shown here is for illustrative purposes only, and there could be more or fewer contact pads without deviating from the spirit of the invention.

Referring to FIG. 2, a FPC 200 is attached to contact pads 102, 104, 106, 108 (not shown) in the circled area 210. Traditionally, FPC can be bound to contact pads using ultrasonic bonding or soldering. With soldering, additional solder bumps need to be incorporated. As mentioned, both prior art bonding methods tend to be cost- and labor-intensive, and bonding using anisotropic conductive adhesive, such as anisotropic conductive film (ACF) CP 9252KS by Sony Corporation of Tokyo, Japan, presents a good alternative.

ACF bonding requires bonding temperature of 150 to 200 Celsius, and a pressure environment of 20 to 40 kg per square centimeters. The bonding time is about 10 to 20 seconds. The process involves cutting the ACF into pieces of desirable size, tacking the pieces unto the surface to be bound, removing the release liner, and bonding under the conditions set out above. ACF bonding also offers the advantage of reworkability. For example, Sony CP9252KS can be reworked by dipping it in acetone for 2 minutes, peeling the ACF, and following up with a Q-tip touch with acetone. ACF bonding also offers good bonding strength. For example, ultrasonic bonding typically offers a bonding strength of about 60 g, comparing with more 130 g for ACF bonding.

Despite the advantages offered by ACF bonding, difficulties remain for applying ACF bonding to a head gimbal assembly. For example, FIG. 3 shows a cross-sectional view of a conventional FPC structure. A conventional FPC 200 usually comprises a base film 301, two sections 305 and 309 of an overcoat layer, with an in-between conductive layer 303 between base film 301 and the overcoat layer. Base film 302 is usually made of insulation material such as polyimide or other types of resin. The sections 305 and 309 of the overcoat layer is made of solder epoxy, photo sensitive solder resist materials, or polyimide film. The conductive layer 303 is usually made of Cu or other similar materials. Between the sections 305 and 309 is the bonding pad surface 307, usually with a plating of Ni with thickness of about 4 μm and a plating of Au with thickness of 1 μm.

FIG. 4 illustrates cross-sectional view of an assembly 400 comprising a wireless suspension bonding pad, such as bonding pad 108 of FIG. 1. Assembly 400 comprises stainless steel base 401, on top of which is an insulating layer 403. Insulating layer 403 can

be made of polyimide or other types of insulating resin. Bonding pad 108 is positioned on top of layer 403, and it comprises, in a typical configuration, an electrode 405 made of Cu, followed by a plating 407 of Ni, and finally a plating 409 of gold at the outermost surface of bonding pad 108.

FIGS. 5A-5C illustrate some of the problems of using ACF to bond the FPC 200 to the assembly 400. FIG. 5A shows that the FPC 200 is positioned on top of assembly 400, with bottom surfaces of sections 305 and 309 overlapping the two ends of bonding pad 108. When ACF film is heated and applied to bond the two components using bonding tools and processing conditions as set forth above, a deformation 510 in the shape of a bridge is formed to make contact between the FPC 200 and assembly 400, as shown in FIG. 5B. Unfortunately, after reliability test, this deformation 510 tends to revert back to its original condition, causing an open circuit problem, as shown in FIG. 5C. Therefore, several novel bonding structures have been invented to solve this open circuit problem.

Illustrated in FIG. 6 is a ball structure 610 which is placed between the conductive layer 303 and the top surface of bonding pad 108. The ball structure 610 can be made of gold in one implementation, or it can be made of other materials in other implementations of the invention. The ball structure 610 can be formed, in one implementation, with stud bump bonding (SBB) flip chip method or gold ball bonding method commonly known in the art. The space surrounding ball structure 610, as well as space 605 and 607, will be filled with melted/cured ACF used for bonding. The presence of structure 610 prevents the deformation of the FPC, and therefore eliminates the open circuit problem. Typically, for a base film of thickness 23 μm, the conductive layer is about 18 μm, and the overcoat layer about 13 μm. Therefore, the ball structure, or bump 610, has a height of approximately 13 μm. Circuit traces are labeled as 601 and 602 in FIG. 6.

Alternatively, as illustrated in FIG. 7, the complete space formed by the top surface of bonding pad 108 (not shown), the bottom surface of conductive layer 303, and the right wall of overcoat section 305 and overcoat section 309 can be filled with filling materials 700. The thickness of this filling 700 is about 13 μm, and it be made of a number of conductive materials including Ni, Au, or a combination thereof. In other implementations of the invention, the filling 700 can be thicker, thinner, to equal to the thickness of the overcoat layer, ranging between 10 to 38 μm. Using a solid filling 700 will achieve the same objective of eliminating the deformation bridge 510, and thereby preventing the open circuit

problem. Note that adhesive layers used in the manufacturing process of FPC 200 may still be present between the base film 301 and conductive layer 303, and/or between conductive layer 303 and overcoat sections 305 and 309.

Another implementation of the invention is the removal of one of the two overcoat sections. In this configuration, as illustrated in FIG. 8, ball structure 610 is still present, but the remaining section 805, the conductive layer 803 and the base film 801 are all of shorter length than their counterparts in a FIG. 6. This approach reduces the amount of manufacturing materials required. Melted/cured ACF fills space surrounding ball structure 610 and space 810.

FIG. 9 illustrates yet another implementation of the invention. In this configuration, only one of the two sections of overcoat layer is present. The bottom surface of section 905 does not overlap the top surface of bonding pad 108. Furthermore, this configuration does not require ball structure 610. At the same time conductive layer 903 binds to the top surface of bonding pad 108 directly using ACF bonding, but does not overlap the top surface completely. Base film 901 extends beyond the length of bonding pad 108, but stops before reaching circuit trace 602. Eliminating the overcoat layer in a FPC will minimize the open circuit problem; however, overcoat section 905 is needed to prevent the shunting problem around the complicated circuit pattern around the bonding pad. This contrasts with the right hand side of bonding pad 108, where conductive layer 903 does not touch trace 602 because of the absence of an overcoat layer between it and trace 602. Therefore, this configuration presents an optimal compromise between the elimination of the bridge deformation in a FPC inherent in ACF bonding, and the prevention of shunting problem around a bonding pad's complicated circuitry.

FIG. 10 illustrates another novel structure of FPC using ACF bonding. Because, as mentioned above, that it is impossible to eliminate the overcoat layer completely, one solution is to form an ultrathin overcoat layer, such as presented in FIG. 10. Overcoat sections 1005 and 1010 are of less than 10 μm thick. They are think enough to prevent the shunting problem, but thin enough to prevent the formation of a deformation bridge in ACF bonding. Because sections 1005 and 1010 are thin, bonding surface 1000 can bond directly to the top surface of a bonding pad without causing a deformation in base film 301 and conductive layer 303.

The above embodiments of the invention are for illustrative purposes only. Many widely different embodiments of the present invention may be adopted without departing from the spirit and scope of the invention. Those skilled in the art will recognize that the method and structures of the present invention has many applications, and that the present invention is not limited to the specific embodiments described in the specification and should cover conventionally known variations and modifications to the system components described herein.

What is claimed is:

1. A flex-print circuit (FPC) attached to at least one bonding pad on a suspension of a head gimbal assembly in a hard disk drive using anisotropic conductive adhesive, comprising:

a base film;

a conductive layer situated below the base film;

an overcoat layer comprising at least two sections situated below the conductive layer, a bottom surface of each section overlapping partially a top surface of the bonding pad; and

a conductive structure forming an electric conduit between the conductive layer and the at least one bonding pad, said anisotropic conductive adhesive being disposed at least surrounding the conductive structure for bonding the FPC to the at least one bonding pad.

2. The FPC of claim 1, wherein the conductive structure comprises gold.

3. The FPC of claim 1, wherein the anisotropic conductive adhesive comprises anisotropic conductive film.

4. The FPC of claim 1, wherein the conductive structure comprises a bump having a height of about 12 to 38 μm.

5. The FPC of claim 1, wherein the conductive structure comprises a gold ball.

6. The FPC of claim 1, wherein the conductive structure comprises a filling completely occupying a space formed by the at least one bonding pad, the conductive layer, and the at least two sections of the overcoat layer.

7. The FPC of claim 6, wherein the filling is less than 10 μm thick.

8. The FPC of claim 6, wherein the filling is about 10 to 38 μm thick.

9. The FPC of claim 6, wherein the filling is thicker than or equal to the overcoat layer.

10. The FPC of claim 6, wherein the filling is thinner than the overcoat layer.

11. A head gimbal assembly (HGA) circuit structure attached to a bonding pad on a suspension of a head gimbal assembly for use in a hard disk drive using anisotropic conductive adhesive, comprising:

a base film;

a conductive layer situated below the base film, a part of said conductive layer attached to the bonding pad using said anisotropic conductive adhesive; and

an overcoat layer situated below a portion of the conductive layer, a bottom surface of said overcoat layer not overlapping a top surface of the bonding pad.

12. The HGA circuit structure of claim 11, further comprising a conductive ball positioned above the bonding pad forming an electric conduit between the conductive layer and the bonding pad.

13. The HGA circuit structure of claim 12, wherein the conductive ball comprises gold.

14. The HGA circuit structure of claim 11, wherein the anisotropic conductive adhesive comprises anistropic conductive film.

15. The HGA circuit structure of claim 11, wherein a portion of said conductive layer is bonded to the top surface of the bonding pad directly using said anisotropic conductive adhesive.

16. A method for bonding a flex-print circuit to a suspension in a head gimbal assembly, comprising the steps of:

Forming a conductive structure between a bonding pad and a conductive layer of the flex-print circuit; and

Bonding the conductive layer to the bonding pad via the conductive structure using anisotropic conductive adhesive.

17. The method of claim 16, wherein the anisotropic conductive adhesive comprises anisotropic conductive film.

18. The method of claim 16, wherein the conductive structure comprises a gold ball.

19. The method of claim 16, wherein the conductive structure comprises a solid conductive material filling.

20. The method of claim 18, wherein the gold ball is formed using stud bump bonding (SBB).

21. A flex-print circuit (FPC) attached to a bonding pad, comprising

A conductive layer bonded to the bonding pad using anisotropic conductive adhesive; and

A conductive bump lodged between the conductive layer and the bonding pad.

22. The FPC of claim 21, wherein the conductive bump comprises gold.

23. The FPC of claim 21, further comprising an overcoat layer positioned below the conductive layer.

24. The FPC of claim 23, wherein the overcoat layer comprises two sections separated by a plating of conductive material, each of said two sections overlapping an end of a top surface of the bonding pad.

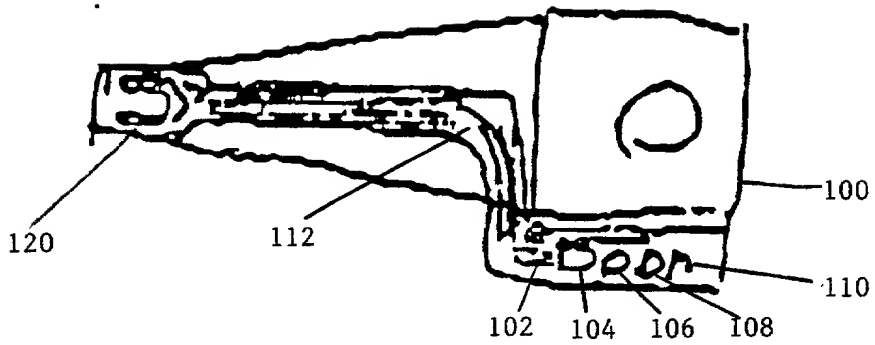
25. The FPC of claim 23, wherein the overcoat layer does not overlap the bonding pad.

26. The FPC of claim 21, wherein the anisotropic conductive adhesive comprises anisotropic conductive film

A NOVEL BONDING STRUCTURE FOR A HARD DISK DRIVE SUSPENSION USING ANISOTROPIC CONDUCTIVE FILM

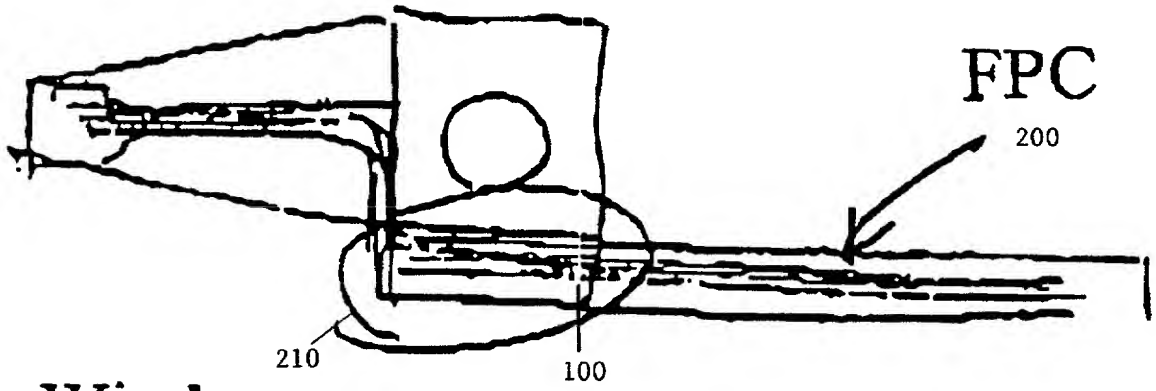
ABSTRACT OF THE INVENTION

A plurality of bonding structures and their forming methods for bonding a FPC to a bonding pad, in particular a bonding pad of a wireless suspension in a head gimbal assembly, using anisotropic conductive adhesive; such structures eliminate the spring-back force in typical anistropic bonding to ensure durable bonding. At the same time, these structures also allow for reworkability under which the bonded parts can be separated easily.



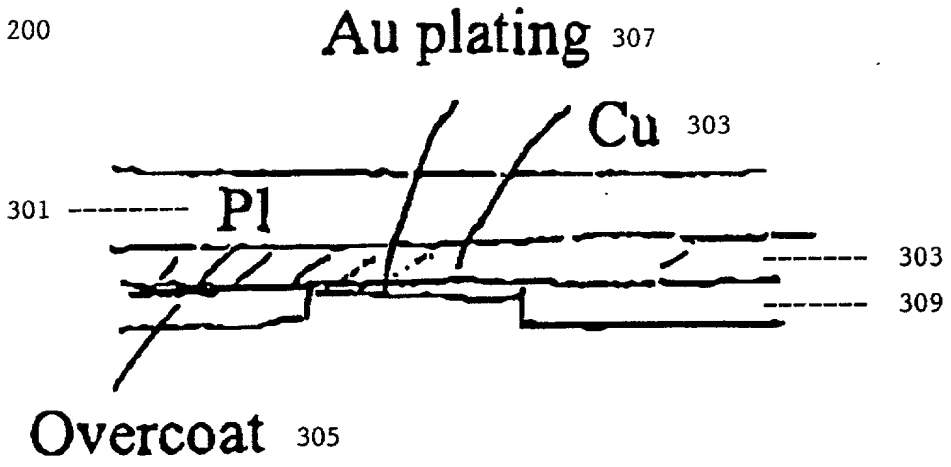
Wireless Suspensions

FIG. 1



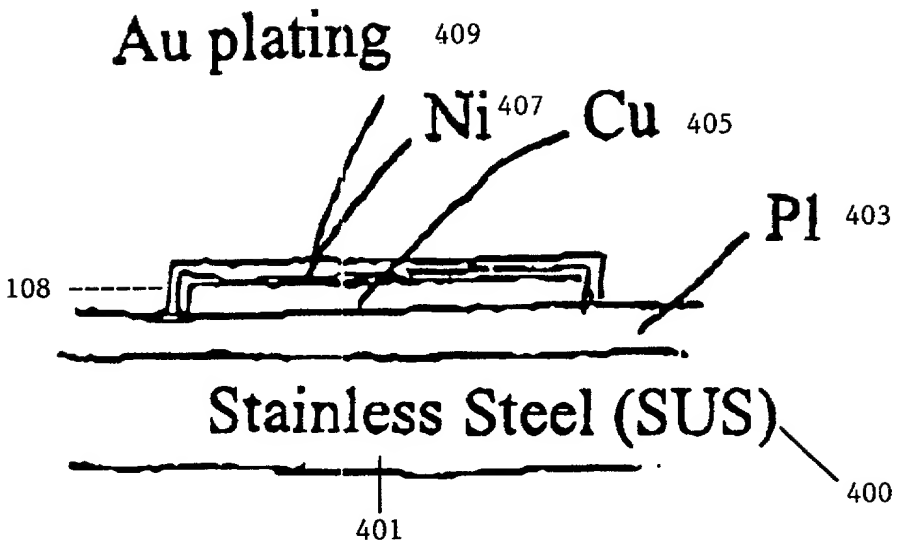
Wireless suspension + FPC

FIG. 2



Structure of a conventional FPC cross section
(prior art)

FIG. 3



Cross-section of the structure of a suspension bonding pad (prior art)

FIG. 4

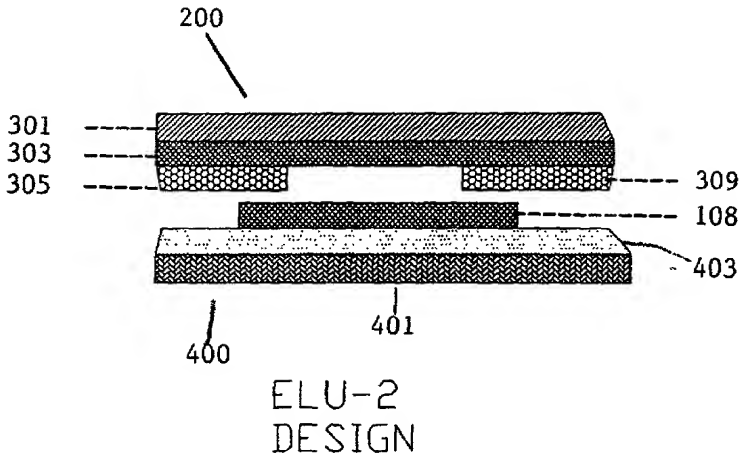


FIG. 5A

Using bonding tool and heat press
make the deformation for contact

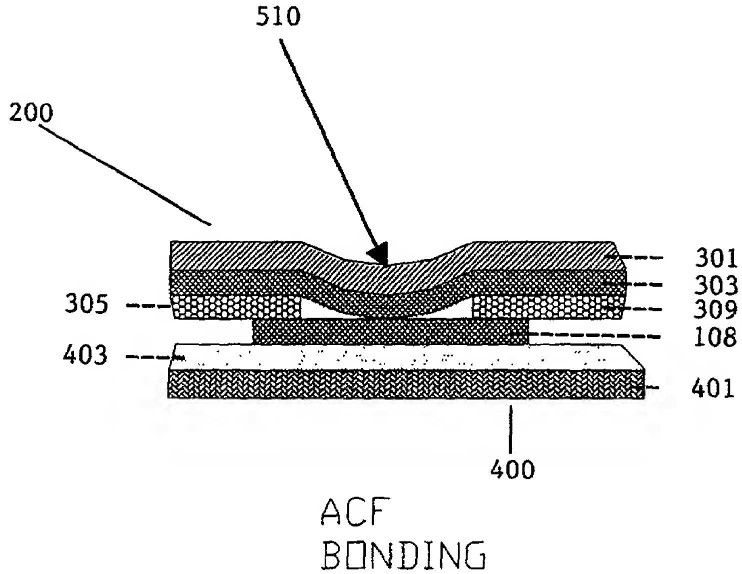


FIG. 5B

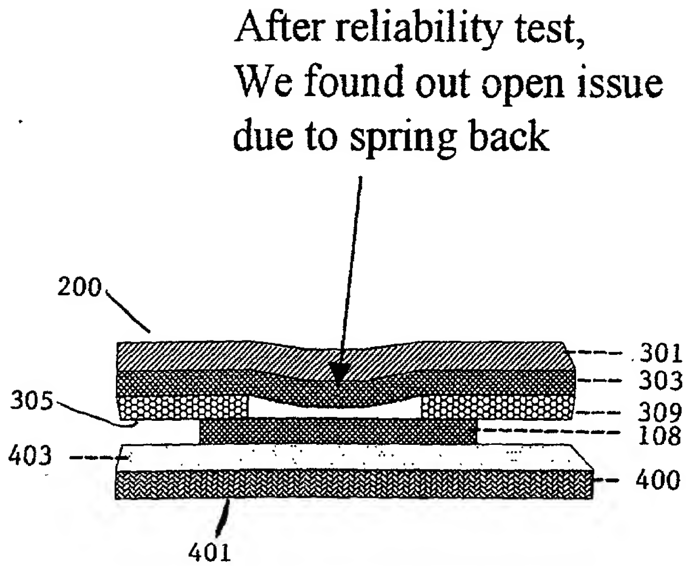

After reliability test,
We found out open issue
due to spring back
200
301
303
305
309
108
403
400
401

FIG. 5C

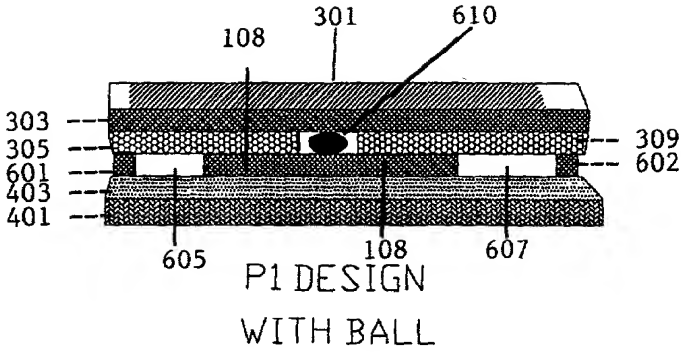

301
610
108
303
305
601
403
401
309
602
605
108
607
P1 DESIGN
WITH BALL

FIG. 6

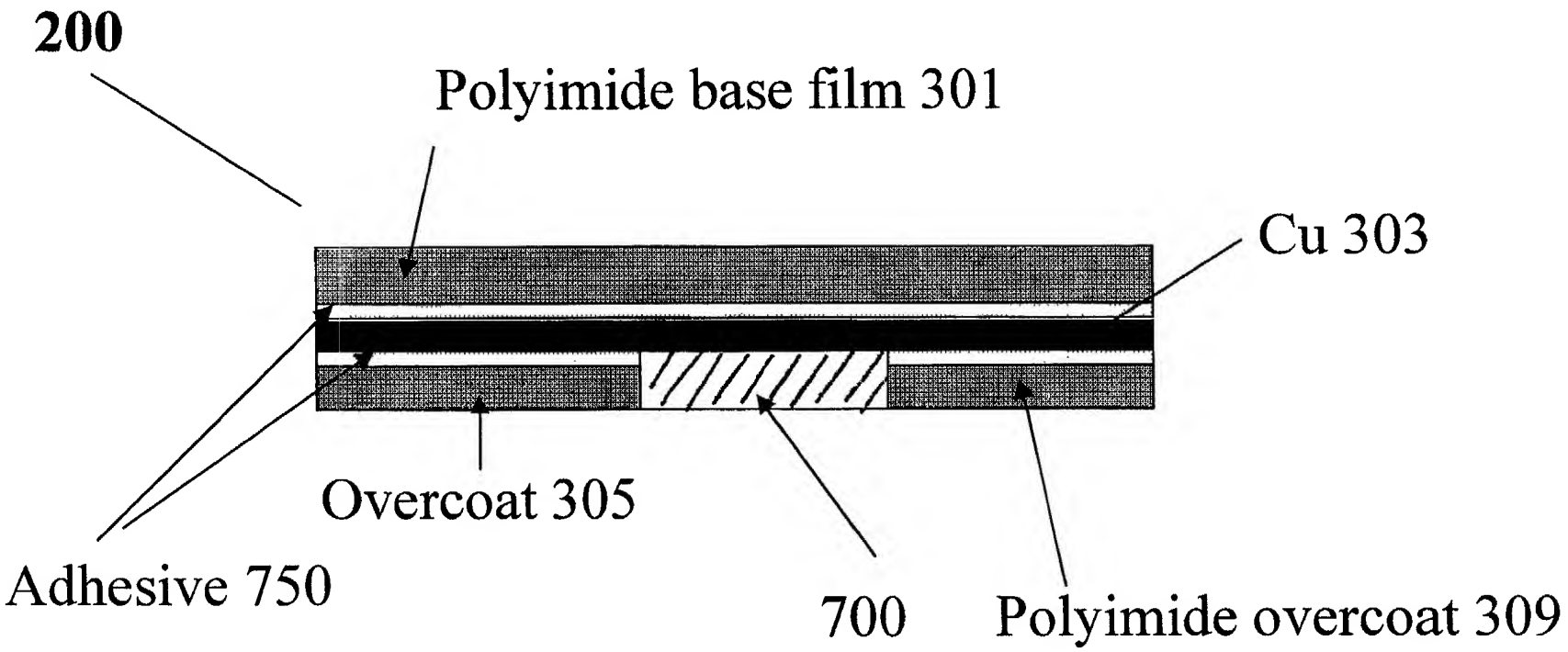

200
Polyimide base film 301
Cu 303
Overcoat 305
Adhesive 750
700
Polyimide overcoat 309

FIG. 7

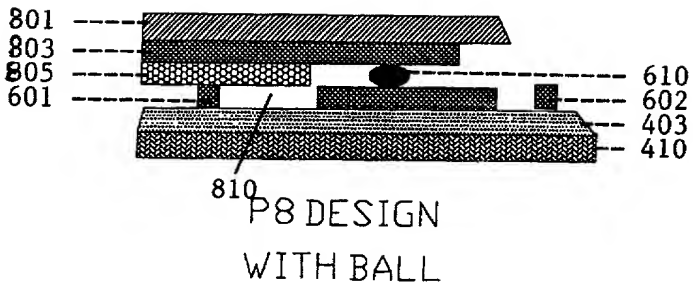


FIG. 8

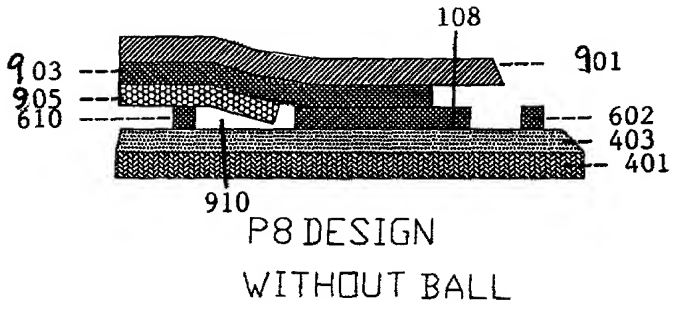


FIG. 9

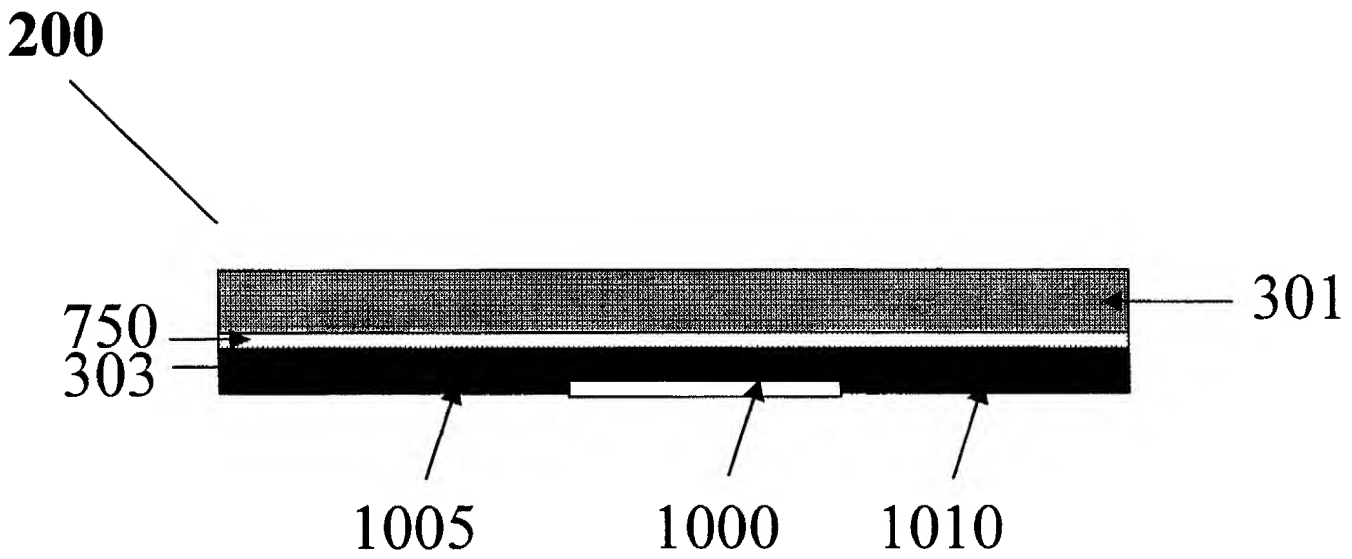


FIG. 10

EXPRESS MAIL NO.: EL563098693US

PATENT
Atty Docket No. 68135486-200600

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A NOVEL BONDING STRUCTURE FOR A HARD DISK DRIVE SUSPENSION USING ANISOTROPIC CONDUCTIVE FILM

the specification of which (check one) _X_ is attached hereto or __ was filed on ___ as Application No. __ and was amended on ___ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed Yes	Priority Claimed No
Number	Country	Day/Month/Year Filed		

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) below.

Application Number	Filing Date
Application Number	Filing Date

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application Number	Filing Date	Status: Patented, Pending, Abandoned
Application Number	Filing Date	Status: Patented, Pending, Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor MASASHI SHIRAISHI

Inventor's signature _____ Date

Residence Suite A602, New World Apartments, 24 Salisbury Road, Tsimshatsui, Hong Kong

Citizenship JAPAN

Post Office Address Suite A602, New World Apartments, 24 Salisbury Road, Tsimshatsui, Hong Kong

Full name of second joint inventor, if any, ICHIRO YAGI

Inventor's signature _____ Date

Residence Flat B, 8th Floor, Tsui King Mansion, Tai Koo Shing, Hong Kong

Citizenship JAPAN

Post Office Address Flat B, 8th Floor, Tsui King Mansion, Tai Koo Shing, Hong Kong